Simmons Speaks Encyclopedically

Codes, Ciphers, Cryptology Clarified

When the 1986 printing of the 15th edition of *Encyclopaedia Britannica* appears early next year, its 12,000-word article on "Cryptology" will bear the initials of Gus Simmons, manager of Applied Mathematics Department 1640.

Over many months of work Gus turned out a comprehensive, carefully honed, fully up-to-date article explaining a field that has emerged only recently from the shadows of wartime secrecy into the full light of modern-day practical and economic relevance.

As Gus outlines, cryptology has helped turn the tide of world wars — the breaking of the Japanese Purple cipher, for example, that gave the United States the crucial edge in the decisive battle of Midway.

Cryptology also makes it possible for you, and only you, to instantly have full access to your bank account merely by punching a few buttons at the nearest automated teller machine. Without cryptology, intercontinental electronic banking and confidential corporate satellite communications would be difficult, if not impossible.

Even such mundane things as lottery tickets contain an encrypted version of the ticket number so that a forger can't make off with the winner's new riches.

"My approach to writing this article was to aim it at a high school student who has read about some new application of cryptology and who wants to know something more," says Gus. "I wrote with this imaginary student in mind. So I wanted the article to be the clearest writing I could do.

"To the extent possible then, it's a tutorial, an easily understood course of instruction into the basic elements of cryptology and its ramifications."

To achieve that kind of clarity, Gus offers many examples. One is how two persons can use a double coin toss to choose a key that ensures the messages they exchange are authentic. "I tried to keep the examples so simple that only the essential point gets across."

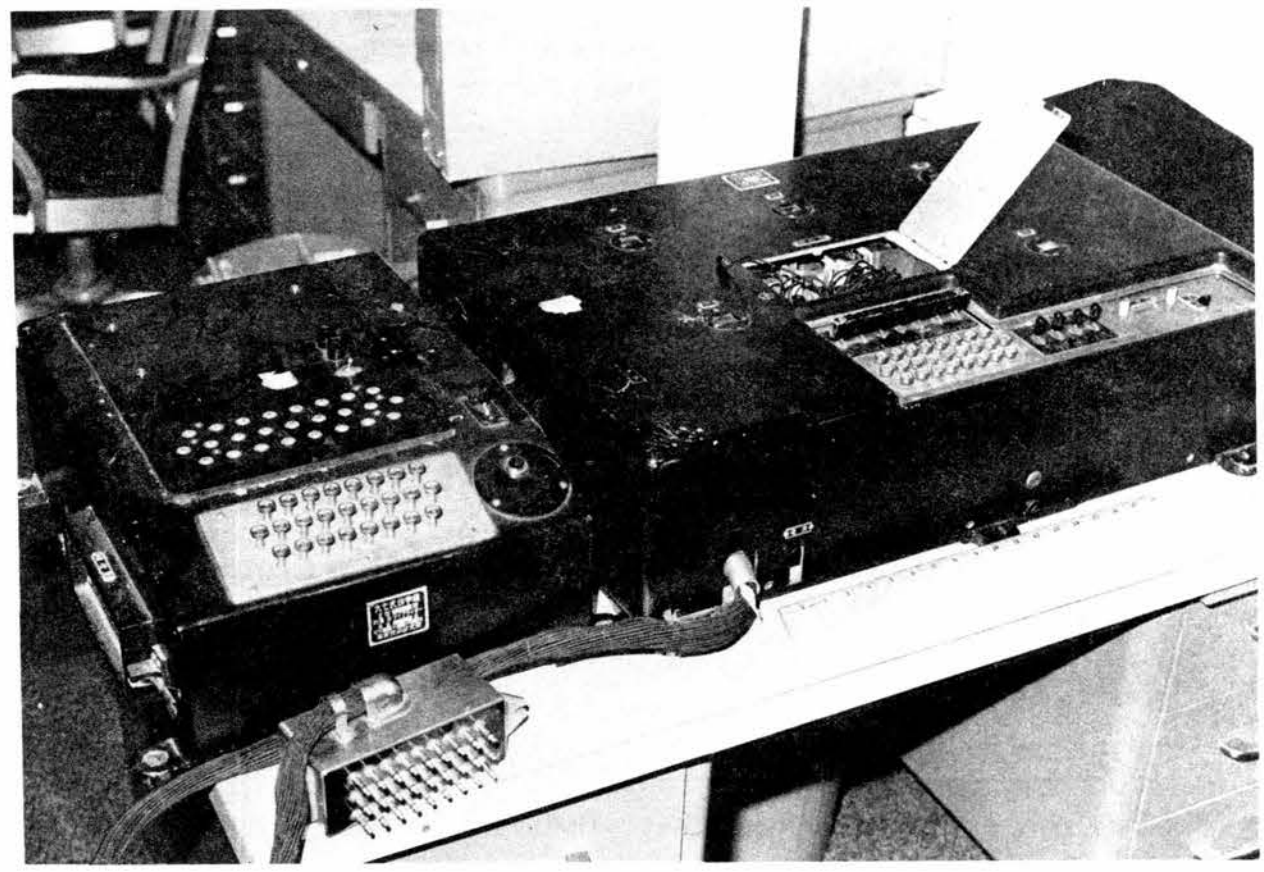
The article begins with careful distinctions among the various terms used in the field. For instance, cryptology, "the science of secure (generally secret) communications," is "the more inclusive term." Gus writes that specialists in the field have adopted the convention that cryptology encompasses both cryptology, which is "the study of the principles and techniques by which information can be concealed in ciphers and later revealed by legitimate users employing a secret key," and cryptanalysis, which is "the science (and art) of recovering information from ciphers without knowledge of the key."

Gus quickly goes on to help the reader understand the important difference between a code and a cipher (only the latter makes use of a secret key). This is the first part of a section on the ABCs of codes, ciphers, and authentication. This section is followed by a general section filled with examples about the practical relevance of cryptology. A large section on cryptography then deals with transposition ciphers, substitution ciphers, product ciphers, the Data Encryption Standard, the key distribution problem, two-key cryptography, and block and stream ciphers.

The next section, on cryptanalysis, begins with examples of "the seriousness of the cryptographer's failure and the cryptanalyst's success" (the Battle of Midway, for example, or the Zimmerman telegram of World War I, which, once decoded, showed that Germany planned to reward Mexico for entering the war as Germany's ally; that knowledge pushed U.S. President Wilson into reversing his stand against entering the war). This section gets into some of the technicalities of the subject and concludes with a brief discussion of factoring large numbers, an area pioneered by Gus's group at Sandia (LAB NEWS, Dec. 16, 1983; Feb. 17 and Aug. 31, 1984).

A long section on history is filled with some fascinating details about, among other things, the breaking of the Japanese Purple ciphers. In the article Gus called this achievement "a *tour de force* of cryptanalysis." But in an interview he put it even more strongly: "Breaking the Purple cryptosystem was the greatest triumph of pure cryptanalysis ever made." This because it was broken only by cryptanalysis

(Continued on Page Four)



NO PHOTOS or examples of the Japanese Purple code machine survived WWII. But in this never-before-published photo of the Jade machine, which replaced Purple near the end of the War, the box on the right is essentially the same as Purple. Both machines used telephone stepping switches to encrypt messages. The box on the left is an output device that printed characters on paper tape. Gus Simmons' (1640) upcoming article for the *Encyclopaedia Britannica* discusses the importance of cryptanalysis in speeding the end of the war in the Pacific.

LAB NEWS

VOL. 37 NO. 22 SANDIA NATIONAL LABORATORIES NOVEMBER 8, 1985

ECP Campaign Wrap-Up

Over the Top, Once Again

The 1985 ECP Campaign chalked up another success story last month. The $1,050,000 goal was exceeded by more than $27,000. Fair Share giving (0.6 percent of salary) rose slightly to 44.8 percent from 44.5 percent, and the percentage of Sandians giving to ECP increased to 88.6 percent from 87.6 percent. The average amount per contributor is $171.

"We are extremely pleased at the tremendous response of Sandians, who continue to recognize that support of community needs is everybody's business," says drive chairman Herb Pitts (3500). "Campaign results are especially gratifying, given the fact that we lost many long-time contributors through retirement this year, and total employment is down. Traditional generosity of Sandia employees continues, even so. I want to offer the thanks of the entire ECP committee to everyone for a job well done."

Antojitos

Odds and Ends (Mostly Odds) from Various Printed Pages From an ad for Sandia secretaries: "The first step in the employment process is a secretarial battery test consisting of grammer, spelling and punctuation." If their batteries test out OK, they'll be able to spell grammar.

From the Albuquerque Journal: "A news story about the opening in the Sunday Journal incorrectly stated that Journal Center opened Monday." If they don't know, who does?

From a Sandia Colloquium announcement: "One salient feature of this paradigm [for the development, maintenance, and evolution of large software projects] is that maintenance and evolution occur by modifying the specification and then rederiving the implementation rather than by attempting to directly modify the optimized implementation." Shoot the arrow, then define the target.

From KAFB's Public Affairs Report: After the Air Force Academy-UNM football game, "Base people bedded 380 cadets in their homes." Part of the Academy's incentive program, no doubt.

From a Weekly Bulletin job posting: Wanted -- "Head Photographer for B. Hawkinson." We already have a leg photog, a torso photog, and two arm photogs. Just need a head photog for mug shots.

From a headline in the Amarillo News: "France explodes nuclear device for second time." Now there's an amazing technological breakthrough!

* * *

More Success for the Public Info Folks Last issue mentioned several noteworthy publications that have featured Sandia stories, thanks to the efforts of our sister division. Now the ultimate accolade, a mention of our silicon-based adhesive foam (LAB NEWS, Feb. 1, 1985) in Playboy: ". . . The substance can be used for a variety of purposes, according to Sandia, but our favorite is its proposed use during warfare. Sandia envisions bombarding an enemy airfield with the adhesive. According to the plan, planes would stick to the ground and be unable to take off. What do you have to say to that, Elmer?"

* * *

Their's a Lesson Here Somewhere Last issue, I twitted the traffic signmakers for their PREPAIR TO STOP sign. And I misspelled (deliberately, I assure you) two words in the paragraph. One was "Apparently" (I made it "Appairently"). Scores of sharp-eyed readers pounced on my "mistake." But not one noticed the other one -- "prepared" was spelled "prepaired" in the heading. ●BH

* * *

Never attribute to malice that which is adequately explained by stupidity.

RUSS ACTON (7537) received the top award at the 19th International Thermal Conductivity Conference last month at Tennessee Technological University, Cookeville, Tenn. The Thermal Conductivity Award plaque cites Russ for "his accomplishments in the field of thermal conductivity and as a mark of the esteem in which he is held by his fellow workers." The award recipient is selected by the Conference's Board of Governors.

Fun & Games

Hockey — A beginners ice hockey clinic for children ages 5 through 9 will begin Nov. 15 at Iceland Arena. The clinic, sponsored by the New Mexico Amateur Hockey Association, will cover basic skating skills, stick handling, passing, and shooting. Each session of the 12-week clinic will include two hours of ice time, plus a talk on game rules, positional play, and sportsmanship. Cost, $75 per child; equipment can be borrowed from the Association at no extra cost. More info from Len Connell, 4-6984.

* * *

Bowling — September Bowler-of-the-Month awards from the SANDOE Bowling Association went to Wayne Yoshimoto (7474-3) and Mildred Smith (2831), top men's and women's scratch series; and Glen Folkins (5113) and Linda Ohrt, men's and women's handicap series. SANDOE's Scotch Doubles Tournament will be Nov. 16-17 at Fiesta Lanes. Fred and Dora Gunckel, 299-4867, have details.

LAB NEWS

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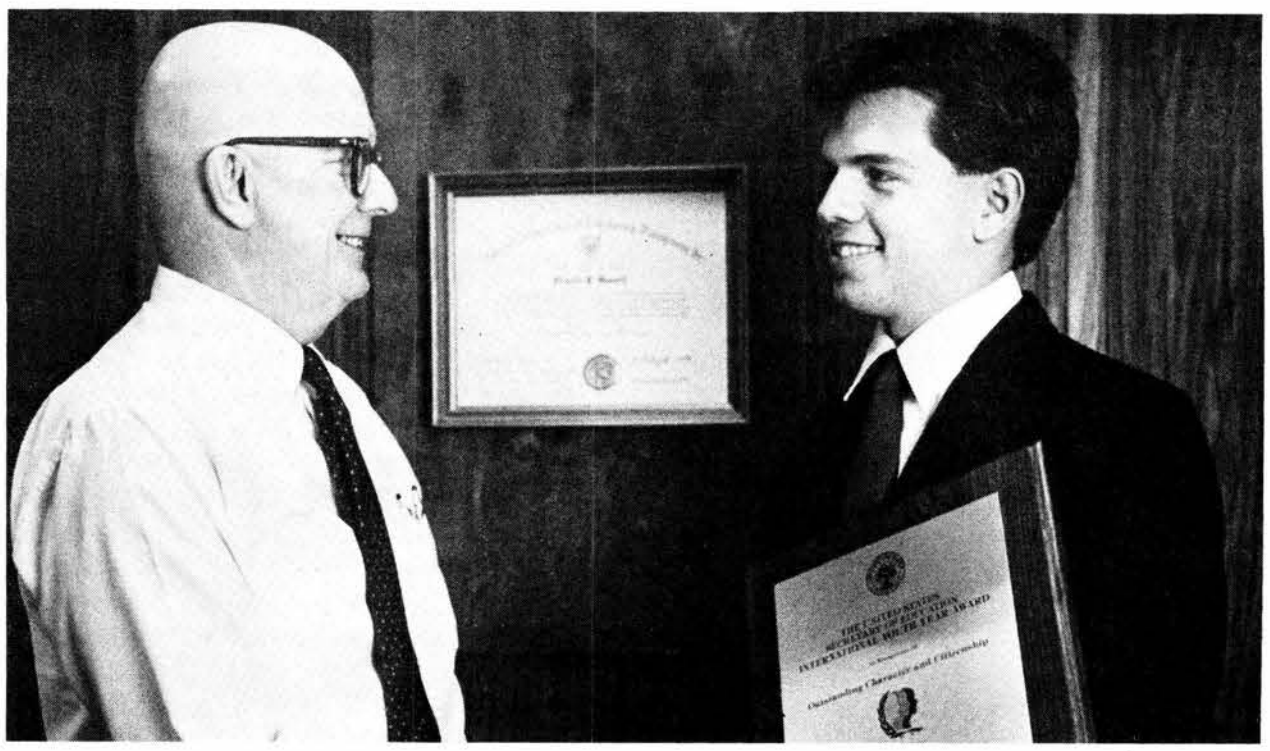


TONY PADILLA, a high school work experience trainee assigned to Purchasing Planning Division 3732, is congratulated by Dick Russell (3700) on the International Youth Year (IYY) Award he recently received from Secretary of Education William Bennett. The IYY awards honor young people of outstanding character and citizenship — those who go out of their way to get involved in community affairs. Of more than 1000 nominations by governors, mayors, and other officials in each state, only 257 award recipients were named. Tony, nominated by Governor Toney Anaya, was one of five recognized in New Mexico. He was cited by the governor for his involvement in voter registration drives, political campaigns, and church and community activities. Tony, a student at Del Norte High School, obtains school credits for his part-time afternoon work at Sandia as a work experience trainee. He is aiming for an accounting career.

High-Altitude Missiles Leave Signatures

New Insights into Plume Models

For the past year and a half, Sandia researchers have studied improved ways to create computer models of the exhaust plumes of large-scale rockets. These efforts concentrate on the high altitude regime, where the plumes are quite extended, so that models based on continuum and equilibrium approximations are no longer valid.

To date, the studies have succeeded in extending the state-of-the-art of plume modeling calculations and have provided new insights into the plume modeling processes.

"Our first task was to understand what a rocket plume structure looks like," explains John Vitko (8348), project leader. "That means we have to know both the fluid dynamics that give rise to the overall structure, and the underlying chemical and collisional processes giving rise to the detected radiation."

Using computer codes developed on Cray supercomputers, the Sandians are able, for the first time anywhere, to compute the spatially and spectrally resolved plume signatures of large thrust engines throughout the entire high altitude regime.

One of the researchers, Wahid Hermina (8245), who developed the Monte Carlo calculation for the enhancement region of the plume (that is, that part of the plume signature that arises from interactions with the atmosphere), talks about the effort: "The Monte Carlo method takes a microscopic view of the gas dynamics, concentrating on collisions between molecules. The calculation is very computer-intensive — it takes many hours of Cray time to trace a full trajectory of the simulated missile."

Others involved in the project include Rich Larson (8244), whose primary responsibility is to understnd what happens inside the rocket engine and how the particulates are formed; Jackie Chen (also 8244), who is studying how the particles interact with the flowfield within the nozzle; and Bill Houf (8245), who deals with the intrinsic core region directly downstream from the nozzle exit.

Verlan Gabrielson (8233) has developed a code called GGP, used in several areas at Sandia, which enables researchers to transfer their data into moving pictures. This capability has been most helpful in the plume effort because the movies help show how the plume varies along the trajectory.

John also credts Fred Hansen (8348) for his work with, and extensions of, the standardized codes used by the plume modeling community to look at issues related to target acquisition, tracking, and pointing; Jim Hogan (also 8348) for determining experimental needs; and Carl Melius and Mike Koszykowski (both 8343) for their studies of the basic mechanisms that give rise to the emitted radiation.

"The plume modeling program has really been — and will continue to be — a very exciting one, thanks to its multidisciplinary nature," John adds. "We bring together the physics, the fluids, and the chemistry, and weave those in a consistent fashion. It's a complex effort — but one that has worked very well."

STUDYING THE SIMULATED enhancement region of a rocket plume on the color graphics terminal are John Vitko (8348), Wahid Hermina, seated, and Bill Houf (both 8245).

SANDIA LIVERMORE NEWS

VOL. 37 NO. 22 SANDIA NATIONAL LABORATORIES NOVEMBER 8, 1985

LEAP Drive Sets Record

Livermore LEAP drive chairman Mike Birnbaum (8243) was leaping for joy as he announced the results last week of the annual employee charitable contributions campaign. Sandians pledged a record $122,700 this year, a whopping $13,700 more than the goal of $109,000.

That success means some 26 local charitable groups will share in nearly 14 percent more funding from the Livermore Employees Assistance Program than last year.

Not only did the number of contributors rise from 902 in 1984 to 927 this year, but the percentage of Fair Share (approximately one hour's salary per month donated) givers jumped 28.7 percent. The average pledge per participant for this coming year is $133, up from $120 last year.

Mike credited the hard work of his volunteer committee with attracting so much attention to LEAP this year. He also praised Sandia's directors and vice-president, who submitted to the spectre of a dunk tank (plus a pie toss in 8100) to increase the number of Fair Share pledges.

Supervisory Appointment

PATRICIA SMITH to supervisor of Publications Division 8265, effective Nov. 1.

Pat began her career as an editor with American College Testing in Iowa City, Iowa, where she worked four and a half years. She joined Sandia at Livermore in July 1981 as a technical writer assigned to the Solar Department. After transferring to the Combustion Research Facility, she did publications work for that directorate until her promotion.

Pat's education includes a bachelor's degree in English from Spalding University, Louisville, Ky., and a master's in technical writing from Rensselaer Polytechnic Institute at Troy, N.Y.

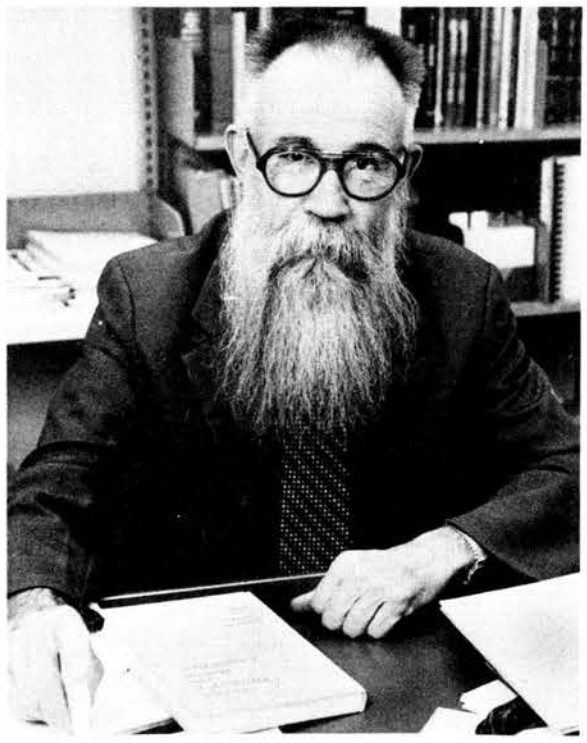
Pat is a member of the Society for Technical Communication and serves as chairman of its Northern California Technical Publications Competition. Among her free time activities she enjoys lap swimming, cooking, and reading fiction. She lives in Danville.

Congratulations

Connie and Bill (8253) Ormond, a daughter, Kristina Marie, Oct. 23.

Here Keys, Here Keys

. . . "A new key ring has a sonic sensor attached that sounds an electronic beeping tone when you clap your hands or snap your fingers four times in a particular rhythm (such as One potato, Two potato, Three potato, Four). Having your keys call to you is a great help if you're the sort who casually tosses them aside when you get home or to the office and then has to organize a search party the next time you need them. With this key chain, just clap and your keys will beep back from wherever they're hiding." *Changing Times*



GUS SIMMONS (1640) recently completed a highly comprehensive article on "Cryptology" for the *Encyclopaedia Britannica*.

Continued from Page One

Cryptology

of the Japanese ciphertext, and no Purple cipher machine was ever captured (apparently none even survived the war). Gus's article will include the first widely published photographs of the Japanese Jade machine, nearly identical to Purple, as well as the first published photo of the functional analog to Purple built by the American group that broke the cipher and routinely used the analog machine to decipher the Japanese command messages.

"I take great pride in being selected to write this article," says Gus. That's natural, especially considering his predecessors. It's only the third "Cryptology" article published in the *Britannica* since World War II. The first, in the 14th edition about 30 years ago, was written by W.F. (Bill) Friedman, the man who led the American team that cryptanalyzed the Japanese Purple cipher. Gus calls Friedman "the greatest cryptanalyst of the time, perhaps of all time."

The cryptology article in the 15th edition, which appeared initially in 1974, was written by Lambros Callimahos, leader and teacher of a very select group of cryptanalysts at the National Security Agency and, in Gus's words, "a very colorful character." Friedman and Callimahos are both now dead. A two-volume book they collaborated on, *Military Cryptanalysis*, was declassified only a few months ago.

"Their articles were very fine articles," says Gus, "but both were severely constrained, and both had a similar bent" — neither was tutorial, and they both went over ancient cryptography "in loving detail," saying much less about more recent matters. They stopped their treatment at the end of World War II, and their discussions of World War II cryptology weren't thorough (they couldn't be; most of the information was still classified when they wrote).

Gus brings the whole subject up to date and emphasizes its newly broadened relevance. One point of new emphasis is the role of message authentication. "In classical times, the sole function of cryptography was to keep a message secret," says Gus. "But there are really two functions of cryptography, secrecy and authentication. For all electronic transactions, you need to have authentication of the source of the message and authentication that the message was not modified.

"In fact, only half the current use of cryptography is secrecy," Gus points out. "The other half is authentication, an important part of cryptography that hasn't been recognized in the popular press. So I've tried to use simple examples that make crystal clear these two related functions."

Gus notes that it was only with advent of two-key cryptography — first publicly revealed in 1976 — that one could separate the authentication function from the secrecy function. Sandia has developed broad experience in authentication. "To verify compliance with a comprehensive test ban treaty, you would need, among other things, to be able to authenticate the information," notes Gus. "You *couldn't* keep it secret" (LAB NEWS, April 13, 1984). And then there is the problem of identification of individuals seeking entrance to a remote sensitive nuclear site: "How can you be certain he is who he says he is?"

Sandia has special R&D responsibilities in these areas, and two-key cryptography is essential. "At Sandia we have a wide range of problems that depend on the authentication channel's being separate from the secrecy channel." Several dozen scientific papers on specific aspects of this work have come out of Sandia.

Gus believes that that Sandia expertise and, to a lesser extent, the recent research in his department on factoring of large numbers and on breaking the knapsack encryption system (LAB NEWS, Oct. 26, 1984) were the main reasons he was invited to write the encyclopedia's article on cryptology.

"We are pleased with the article," says *Encyclopaedia Britannica* deputy editor Bob Rauch. "The editor believes that we will have one of the best articles of its type on cryptology. It really is on the cutting edge and benefits greatly from Dr. Simmons' own involvement in the field."

(Continued on Next Page)

Secrecy vs. Authenticity

Ensuring a message's secrecy and ensuring its authenticity are similar but not identical functions of cryptology. Historically, secrecy was the primary goal of the cryptographer: "I want you, and only you, to be able to read the message I send you."

But, increasingly, the cryptographer is asked to provide a guarantee of authenticity: "I don't care whether someone else can *read* my message, but I want both of us to be assured that the message I send you has not been tampered with." One example with which Sandia was involved is the data from the National Seismic Stations, which detect the seismic signals generated by underground nuclear detonations: the host country must be able to read the data, but the country on the receiving end must be sure that the data are authentic (LAB NEWS, April 13, 1984).

But examples of authentication procedures are easy to find in daily life as well. Two occur when you write a check to a merchant. First, the merchant tries to authenticate that you are who you say you are — hence the check of driver's license/credit card/etc. And you try to authenticate the dollar amount on the check — you write the amount in both figures *and* words, and you probably draw a line after the script version so no one converts your "One" into "One thousand" and depletes your checking account.

Gus Simmons' article in the upcoming *Encyclopaedia Britannica* (see related article) includes "the simplest possible" example of a cipher used to protect the secrecy of a message from A to B to buy or sell a particular stock. Given that eavesdroppers have access to the communication, A and B agree in advance as to whether A will lie or tell the truth in what he says to B. To make the decision unpredictable, they secretly flip a coin before each transaction: heads means A will say "buy" when he wants to buy, "sell" when he wants to sell; tails means he'll say "sell" when he wants to buy, "buy" when he wants to sell. In chart form, the cipher is:

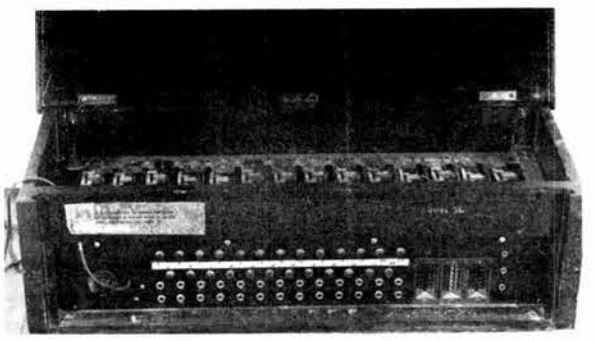
		Action	
		Buy	Sell
Key	Heads	Buy	Sell
	Tails	Sell	Buy

The example can be carried a step further to illustrate the second function of cryptography, authentication. Suppose B wants assurance that the message actually comes from A, not from an eavesdropper pretending to be A. A and B could secretly flip a coin twice to choose one of four equally likely keys: heads/heads, heads/tails, tails/heads, tails/tails. Now the chart looks like this:

		Action	
		Buy	Sell
Key	Heads/tails	Buy-buy	Sell-buy
	Heads/tails	Buy-sell	Buy-buy
	Tails/heads	Sell-buy	Sell-sell
	Tails/tails	Sell-sell	Buy-sell

Then, if A calls B and says, "Buy, sell," and B remembers that the coin flips came up heads/tails, B has a 50 percent assurance at least that A wants to buy the stock and that the message really did come from A (that is, there's a 50 percent chance of an eavesdropper's "Buy, sell" command appearing in the row that doesn't correspond to the proper key — the Tails/tails row in this example).

The most widely adopted and used cipher in the history of cryptography has a similar secrecy-plus-authentication function. It's the DES (data encryption standard) that has been used since the late 70s to protect the privacy and the integrity of confidential records and of electronic fund transfers between financial institutions.



BREAKING THE PURPLE CODE sped U.S. victory in the Pacific during World War II. This machine, a functional analogue of the Japanese Purple machine, allowed U.S. forces to decode the command messages that showed an attack on the Aleutians was merely diversionary and that disclosed the order of Japanese attack at Midway. The machine was built by Bill Friedman, whom Gus calls "the greatest cryptanalysts of the time, perhaps of all time," in 1940.

Continued from Page Four

Cryptology

Rauch says it will replace the "badly out of date" cryptology article currently in the 15th edition. Rauch adds that Gus has been very patient with them throughout the editorial process: "He's a wonderful person to work with."

"I realize that to them this is an esoteric topic," says Gus. "So I'm a bit surprised but most happy that they accepted it at full length. I hope I managed to make the distinctions between authentication and secrecy, and between two-key and single-key cryptology. I also hope that I've made a major stride in clarifying the language of cryptology. I tried to make clear the overwhelming nature of the key-distribution problem in cryptology and what you have to do to get around it.

"I put a great deal of effort into it, because it's going to be around for twelve to fifteen years." • Ken Frazier (3161)

For the Tom Sawyers

Several of the examples of ciphers and codes that Gus mentions in his encyclopedia article on cryptology would delight those of us who are kids at heart. Here's a brief and simple one that depends on an easily remembered key word (AUTHOR, in this case) to determine the order, or route, in which the columns of a rectangular matrix are to be read to decrypt this secret message:

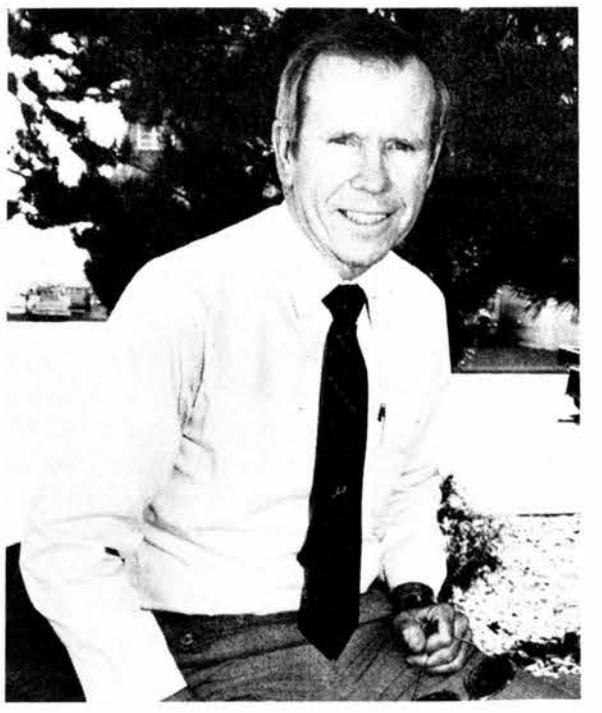
WIREEROSUAEVARBDEVSCACDOFESEYL

To decrypt the message, arrange these letters under the letters of the key word with the first sixth (AUTHOR has six letters) of the message under the A (the first letter of the key word alphabetically), the second sixth under the H (second alphabetically), the third sixth under the O, and so on. Thus:

A	U	T	H	O	R
W	E	A	R	E	D
I	S	C	O	V	E
R	E	D	S	A	V
E	Y	O	U	R	S
E	L	F	A	B	C

The cipher, read horizontally, then translates as "We are discovered — Save yourself" with an ABC thrown in to make the total number of letters divisible by six.

MARV TORNEBY (3530)



GLEN WHITING (5122)

Supervisory Appointments

MARVIN TORNEBY to manager of Personnel Department 3530, effective Nov. 1.

Marv came to Sandia in 1961 and worked as a staff member in auditing, vouchering, purchasing, and the Tech Library. Since being promoted to division supervisor in 1969, he worked in the Library for five years, in EEO/Affirmative Action for five years, and, since 1979, in Personnel.

Before coming to Sandia, he served four years in the Navy.

Marv has a BBA and an MBA from UNM and is a member of the Southwest Placement Association.

He enjoys classical music and sings second tenor in his church choir, quartet, and trio.

Marv and his wife, Mary Ellen, live in the Northeast Heights. Their daughter is a senior at UNM, and their son, Mike, works in Div. 3426.

* * *

GLEN WHITING to supervisor of Weapon Program Integration Divison 5122, effective Oct. 1.

Glen became a member of the first Technical Development Program (TDP) class when he joined Sandia in February 1960 after receiving his BS in ME from the University of Missouri at Rolla. He worked in Phase 3 weapons development and on weapon-related advanced development programs until the late 1960s, when he transferred to the space isotope power organization. After another stint in Phase 3 weapons development work from 1970 to 1979, he spent four years in the Strategic Petroleum Reserve program. Most recently, he's worked on advanced weapons studies in Phase 1 and Phase 2 Division 5161.

He received his master's degree in ME under TDP from the University of New Mexico in 1962.

Glen enjoys jogging, golf, skiing, and camping. He has six grown children and lives in the NE Heights.

Stress Study Seeks Sandians

Stress. Yes, it does correlate with a shortened lifespan, but it's not really a good predictor of how long you'll live — too many other variables that the medical researchers haven't yet identified.

In an attempt to isolate those variables, a UNM PhD candidate, Phoebe Becktell, is doing a study on "Stress and Mediating Resources." Essentially, she's getting information from people who lead stressful lives and from those who do not. And she'd like some help from a couple of hundred Sandians.

Her survey will ask about diet, exercise, childhood environment, support systems, and other variables that affect our ability to withstand stress. And the survey's quite comprehensive — it takes two or three hours to fill out. But, she says, "It's fun to take. And it's an opportunity to help researchers fill in some of the major gaps in our knowledge of how stress affects people's lives. After all, it seems to hasten the death of some people, but others seem to thrive on it, actually seek it out."

Dr. Paul Mossman (3300) thinks enough of her project that he's having the surveys offered to Sandians currently undergoing routine physical exams. And he's looking forward to Phoebe's presentation of the survey results to Sandians, once the data have been analyzed.

The surveys are absolutely confidential, so no individual feedback will be available. If you're willing to participate in the study and are scheduled for a physical exam by Medical before the end of the year, ask for a survey packet during your exam so your height, weight, and vital signs can be measured for the study at that time.

If you're not scheduled for an exam this year, pick up a survey packet from Sue Tenbroek (3321) anytime. Then stop by Medical (T-13, Rm 1) on Nov. 22 between 8 and 11 a.m. or 1 and 3 p.m. so Phoebe can take your measurements. Either way, return your completed survey package to Sue via company mail.

Four New Ideas from Sandia Chosen by *Science Digest*

Science Digest traditionally features its "Top 100 Innovations of the Year" in the December issue of the magazine. Four Sandia ideas made the list this year. *Science Digest* describes them and the innovators as follows:

INNOVATION: Ionization Front Accelerator (IFA).

INNOVATOR: CRAIG OLSON (1241).

A conventional linear ion accelerator generates an average accelerating field of about one million volts per meter (1 MV/m). "For years," says Olson, 43, of Sandia's Plasma Theory Division, "people have been trying to figure out how to create much higher fields." That is precisely what the IFA is doing. It has already produced accelerating fields of 33 MV/m and in the future should increase that figure to 1,000.

The machine uses a beam of negatively charged electrons injected into a gas-filled tube. A laser beam swept along the length of the tube ionizes the gas and creates a moving ionization front. The electron-beam front, which appears as a ball of negative charge, moves down the tube following the ionization front, attracting and carrying along positively charged particles, such as protons. To accelerate the moving electron-beam front, Olson accelerates the swept laser. "The concept," he says, "should permit the development of compact accelerators for such diverse fields as cancer therapy and military applications."

INNOVATION: Increased Efficiency of Heavy-Oil Recovery

INNOVATOR: DANIEL AESCHLIMAN (6256).

To help get molasses-thick, heavy oil out of the ground, production engineers ease its flow by heating it with steam. The steam is carried down steel tubes that are insulated except at couplings where the tube sections are joined. Aeschliman, 47, of Sandia's Geotechnical Engineering Division, was able to prove through extensive testing that a surprising amount of the steam's heat is lost at these couplings in a process called well-bore refluxing: Small amounts of water on the outside of the tubes flash into steam when they contact the hot couplings. As this steam rises, valuable heat is transferred to the well-bore casing and, subsequently, to the surrounding rock. The steam condenses, and the water travels down the casing walls until it again contacts a coupling, whereupon the process begins anew. The severity of heat loss was difficult to detect because the refluxing occurs deep in the well.

Once he had defined the problem and demonstrated its extent, Aeschliman devised an inexpensive solution: a doughnut-shaped piece of Teflon to insulate the couplings. It should save the oil industry, and ultimately consumers, millions every year.

INNOVATION: Algorithm to Break "Multiply Iterated Knapsack" Cryptographic System.

INNOVATOR: ERNEST BRICKELL (formerly 1641).

A major problem in encoding secret messages is that the cryptosystem—the formula by which letters are coded into numbers—must first be agreed upon by both sender and receiver. This leaves the formula open to interception in transit. In the mid-1970s, cryptographers developed a new kind of system, called public-key cryptography, that is based on hard-to-reverse mathematical operations. Its advantage was that the encoding formula could be made public, but that the decoding scheme from which it was derived couldn't be inferred; it stayed secret.

Until recently, there were only two such systems that appeared to work. Now the number may be down to one. Brickell, 32, now at Bell Communications Research Corporation, developed a logical process for breaking the most advanced version of the knapsack system (so called because breaking it is analogous to guessing the weight and number of individual stones in a sealed knapsack). He won a $1000 prize—and the respect of the knapsack's inventor.

INNOVATION: Microcomputer-Based System for Voice-Operated Wheelchair

INNOVATOR: PAUL HOFSTADLER (2112).

Hofstadler, 23, began designing his voice-activated wheelchair as a 20-year-old electrical engineering student at the University of New Mexico. He used a standard wheelchair and an Apple II+ computer together with a voice-processing module built around a 6809 microprocessor. At Sandia, where he is in the Integrated Circuit Simulation and Modeling Division, his ultimate chair comprises four major elements—computer, power and safety systems and the mechanical chair itself—to become a controlled environment for quadriplegics like Hayden Dillon, for whom Hofstadler developed the prototype system. The final year of Dillon's life was his most fulfilling, thanks to the chair: It responded to 19 commands and brought him mobility for the first time, at 36 years of age.

Five innovations from AT&T Bell Labs also were selected for the "Top 100," including a widely hailed linear-programming algorithm developed by Narendra Karmarkar. The algorithm may be capable of solving incredibly complex problems hundreds of times faster than current methods.

All four new ideas from Sandia have been covered in the LAB NEWS. We featured Craig Olson's ionization front accelerator as recently as September, and Dan Aeschliman's well-bore refluxing process in May. Ernie Brickell's feat of breaking the knapsack system received front-page treatment in October 1984 (Ernie transferred to Bell Communications Research in August). A story on Paul Hofstadler's voice-operated wheelchair appeared in July 1984. So if you're an avid LAB NEWS reader, you can say "I told you so."

The Myth of the Teflon Spin-Off

. . . "Teflon was invented in the DuPont chemical company's labs in 1938, entirely by accident, by Roy J. Plunkett, a chemist. Tests on the white, waxy solid material revealed its unusual thermal and chemical properties. Because of these properties, Teflon was at first used only in defense projects. Teflon became commercially available in 1948, but even then was used primarily by industry. It was mated with the electric frying pan in 1961 — about the same time the space program began using it for insulation, space suits, nosecones, fuel tank linings, and dry lubricants. Interestingly, Teflon and the space program entered public consciousness at the same moment. Teflon can almost be called a 'reverse spin-off' — while NASA's needs led to new uses for DuPont's Teflon, NASA did not invent the fluorocarbon — and the agency *never* sprayed it on a frying pan."

Bridget Mintz Register, *Space World*

Required Reading

Science Digest Features Dacey, Sandia

A seven-page article, "Technology on a Grand Scale," in the December issue of *Science Digest* portrays Sandia and its outgoing (in both senses of that word) president as seen through the eyes of Frank Rose, a contributing editor of the magazine and author of a new book on artificial intelligence.

Rose's portrayal appears accurate, at least when describing the Labs and its role in nuclear defense and energy programs. He notes that our skills in weapon engineering technologies have led to successes in solar and fossil fuel programs (parabolic trough reflectors and downhole steam generators, for example). He also points out that we may be able to achieve "ignition in a fusion reactor — a feat that has eluded university and national laboratories — in only three years time" and that we're moving rapidly into Strategic Defense Initiative work — "research on weapons of the future, including the design and testing of particle-beam weapons and kinetic-energy projectiles — 'smart rocks' that could lend a David and Goliath touch to war in space."

Beyond Rose's wide-ranging discussion of Sandia's technological achievements lie several pithy quotes garnered from President George Dacey on how Sandia fits into the American R&D scene: "If you have a big problem to solve, it takes a big company to solve it. There are some things an individual scientist can do if he's a genius, but if your problem requires the integrated application of many disciplines, that can be done only in a multidisciplinary environment .... We have a lot of very good science going on, but it's all in areas we think are going to be relevant to our mission. We are very big in solid-state physics. We're very big in high-pressure mechanics. We are getting to be big, I hope, in artificial intelligence. We are the leading laboratory in pulsed power."

As Rose puts it, "Sandia is indeed a gargantuan institution. It has 1000 scientists and 1700 engineers, more than 1000 of them with PhDs, adding up to a research staff that's bigger than Harvard's and MIT's combined; and with nearly $1 billion per year in government funding, it has a budget to match."

Sandia resembles the old Bell System, says George — "a fully integrated operation with a monopoly on a product. The result, in my rather prejudiced view, is a commitment to excellence and a kind of integrated operation that is hard to find elsewhere in our society outside of large private industries."

As might be expected, Rose looked for misgivings among the several Sandians he talked with about their working for a lab that designs and tests nuclear weapons. "One of the first things you discover about Sandia is that nobody there has any qualms about the kind of work that goes on at the place." And he quotes George on the subject: "It's not that you want to kill people. Once you have accepted the notion that there are going to be nuclear weapons and that this country is going to have to depend on nuclear weapons for its security, and once you overcome any temptation toward moral revulsion, you recognize that you are doing something very important — important for the country, important for the survival of Western freedom."

Are we trying to manage the unmanageable (that is, nuclear weapons)? Rose answers his own question in the negative: "The lab is responsible for every phase of a weapon's existence, from conception to retirement, and part of its job is to develop fail-safe mechanisms that anticipate any eventuality, from terrorist assaults to bad thunderstorms to a lunatic commander." At the same time, he writes, "The key to the Sandia character is discipline, the kind of discipline that comes from knowing the things you design might actually get built — and that if they do get built, they'll have only one chance to work." In other words, Rose credits us with successfully meeting the twin challenges of both safety and reliability.

So Rose describes Sandia pretty accurately. "He captured the spirit, the competence of the place very well," said George after reading the article.

But Rose's description of George himself is one LAB NEWS would not have created: "A large, florid individual with ears as large as LBJ's."

George's response: "The better to hear you with, my dear."

Sandia FY85 Payroll Exceeded $300 Million

The Sandia payroll for fiscal year 1985, which ended Sept. 30, amounted to $269.8 million at SNLA and $42.2 million at SNLL. For FY84, these figures were $249.1 million for Albuquerque and $40.3 million for Livermore. Salaries of some 80 employees at NTS and TTR are included in the Albuquerque figure.

At the end of FY85 Sandia had 8253 employees on roll, including 1074 at Livermore. This total is 174 fewer than at the end of FY84.

Assets of the DOE's installations operated by Sandia totaled $870.2 million at the end of FY85, compared to $761.7 million in FY84. These figures represent acquisition cost of buildings and facilities at SNLA, SNLL, and TTR. All assets are the property of DOE, but are used and operated by Sandia in research and development work for DOE.

Purchases by Sandia in New Mexico amounted to $203.1 million for FY85. About 96 percent of the amount, or $195.8 million, went to Albuquerque firms. Purchases from other DOE contractors are not included. Purchases in the state in FY84 amounted to $175.1 million.

Take Note

The Outstanding Conference Paper Award for the best paper presented at the annual Nuclear and Space Radiation Effects Conference in Monterey, Calif., last July went to co-authors Peter Winokur, Dan Fleetwood, Paul Dressendorfer (all members of Advanced Microelectronics Development Division 2144), Ellis Errett (former Sandian), and Danny Turpin (contractor employee assigned to 2144). Their paper was entitled "Optimizing and Controlling the Radiation Hardness of a Silicon Gate CMOS Process." A plaque noting their achievement will be presented at next year's conference.

* * *

"The Next 100 Years" in space technologies is the subject of Paul Hanover's speech at the Nov. 14 meeting of the AIAA. Hanover, an AIAA Distinguished Lecturer, will present his views on permanent space stations, the likelihood of a slowdown in space programs, and more. The meeting is at the El Patron Restaurant (Wyoming Mall) and begins at 6; it's $10 for members and guests. Reserve by Nov. 12 with Gary Polansky on 4-2462 or Terry Jordan on 4-1899.

* * *

The New Mexico Network for Women in Science and Engineering — Albuquerque Chapter will hold a dinner meeting on Nov. 13 at the Club House in Towne Park (on Chico, east of Eubank). Dawn Johnston (1201) will speak on "Project Management," Helene Fellen on "Relationships of Working Women." Dinner and drinks are $5. RSVP to Jenny Negin (3532) on 4-7165 or Marilyn Morgan (EG&G) on 6-5612.

* * *

The next meeting of SAMPE (Society for the Advancement of Material and Process Engineering) is on Nov. 13 at El Patron Restaurant (Wyoming Mall). Gary Henry of 3M will speak on "Micro Finishing Products Today, Tomorrow, Beyond — Laser Optics." Cocktails at 6:30; dinner, business meeting, and program begin at 7. The public is invited. More info and reservations from Ken Wischmann (7472) on 4-7532.

* * *

Linda Branstetter (1524) was one of five finalists in the Albuquerque BPW's (Business and Professional Women) recent competition to select an Outstanding Young Careerist.

* * *

Mike Anderson of the Beneficial Life Insurance Company will present a short seminar describing a generic life insurance concept that's an alternative to the standard Spouse Annuity Option offered at retirement. The seminar is Nov. 13 at 4:45 at the Coronado Club, Rm. B-5.

* * *

AHA, happy twentieth! Mike Rex (3521) tells us that the Animal Humane Association's 20th Anniversary Celebration will take the form of an auction of a wide variety of items/services: three nights at the Sir Francis Drake Hotel in San Francisco (including airfare) for two, the Cowboys-Giants game on Dec. 15 (including tickets, airfare, and hotel) for two, a balloon ride, color TVs, a VCR, a microwave, Angel Fire lift tickets for two for seven days, a Jim Walston (3155) print, a Faith Perry (3523) painting, an R. C. Gorman (non-Sandian) print, six cars for the best bid over dealer cost, Wool Warehouse tickets for two, several free movie videotape rentals, and more. Proceeds go to AHA. The Nov. 14 event begins at 4:30 with entertainment, hor d'oeuvres, cash bar, and auction item viewing; the auction begins at 6. The place is the Continental Inn (near I-25 and San Mateo).

* * *

KAFB's Arts & Crafts Center has set its Fifth Annual Christmas Festival — door prizes, one-of-a-kind arts and crafts, and Santa — for Nov. 17 at the Enlisted Club from 11 a.m. to 4 p.m. Call the Center on 4-0222 for more info.

* * *

The Beta Aloosters Toastmasters Club meets on Mondays from 12-1 at the Coronado Club. For more info, call Ida O'Guinn, 265-0424, or Rich Yoshimura, 294-0224.

Socratic Compuphobia

. . . "Educators have long sensed the power of the computer to revolutionize their profession, but they do not all embrace it with enthusiasm. It was the same with the beginnings of the book. In ancient Athens when writing was the exciting new technology, the philosopher Socrates warned his students that the written word would create forgetfulness in the learners' souls and cause them to lose their memories. Practicing what he preached, Socrates never wrote a line. His works might never have had the monumental impact they did if his admirers had not disregarded his strictures against writing. Perhaps some of today's professors with little regard for the computer will be remembered in the future only because their words and thoughts are accessible through computerized data banks."

Edward Cornish, *Los Angeles Times*

Events Calendar

Nov. 10— Movietime at the KiMo — Love to Laugh Series: "Love and Death," American (1975), directed by Woody Allen, 7 p.m., KiMo.

Nov. 11 —Film, "The Marsh — A Quiet Mystery," Central New Mexico Audubon Society's Nature & Wildlife Series, 7:30 p.m., Popejoy Hall.

Nov. 12 — Annual San Diego Feast Day; early afternoon Corn dance, all-day trade fair (Jemez); all-afternoon Buffalo, Comanche, Deer or Flag dances (Tesuque); contact pueblos.

Nov. 14-16, 21-23 — UNM Experimental Theatre Series, "The Imaginary Invalid" by Moliere, 8 p.m., Rodey Theatre, 277-4402.

Nov. 14-17 — "Macbeth — A Modern Mestizo Story, " La Compania de Teatro de Albuquerque, 8 p.m. Nov. 14-16, 2 p.m. Nov. 17. KiMo, 766-7816.

Nov. 15— Chamber Orchestra of Albuquerque concert: David Oberg, conductor; Kathleen Clawson, mezzo-soprano; 8:15 p.m., Albuquerque Little Theatre, 247-0262.

Nov. 15— Chinese Golden Dragon Acrobats and Magicians of Taipei, sponsored by ASUNM's Popular Entertainment Committee, 8 p.m., Popejoy Hall, 277-5602.

Nov. 15-17 — Southwest Arts & Crafts Festival, Sat. 10 a.m.-9 p.m., Sun. 10 a.m.-6 p.m., State Fairgrounds.

Nov. 16— All Gershwin pops concert, New Mexico Symphony Orchestra; Neal Stulberg, conductor; 8:15 p.m., Popejoy Hall, 842-8565.

Nov. 17— Concert, Emerson String Quartet (Beethoven, Ives, Dvorak), 8:15 p.m., Woodward Hall, 842-8565.

Nov. 17 — Movietime at the KiMo — Boy Meets Girl Series: "Greed," American (1923), silent b/w, 7 p.m., KiMo.

Nov. 20 — "Macbeth — A Modern Mestizo Story," La Compania de Teatro de Albuquerque, free admission, 8 p.m., South Broadway Cultural Center, 256-7164.

Nov. 21 — Showtime at the Kimo: classical guitarist Oscar Ghiglia (Segovia protege), 8 p.m., KiMo, 766-7816.

Nov. 21-24 — New Mexico Hunter-Jumper Horse Show, State Fairgrounds.

Nov. 22 — Crownpoint rug auction, rug viewing at 3 p.m., auction at 7 p.m., Crownpoint Elementry School, 786-5302.

Nov. 22— Walt Dickerson (vibraphone) and Andrew Cyrille (percussion), guest artists sponsored by NM Jazz Workshop, 8 p.m., KiMo, 842-6659.

Nov. 22-23 — "A Gift of Dance," New Mexico Ballet Company's holiday production, 8:15 p.m., Popejoy Hall, 277-3121.

Nov. 23— "Sentimental Forties," four-part barbershop harmony singing: Enchanted Mesa chapter of Sweet Adelines, Inc.; two shows, 3 p.m. and 8 p.m.; adults $6, seniors and children, $4; KiMo.

Medical Corner

Smokers: Rev Up for the GAS

It's time to GAS up — your chance to act on that promise to yourself to quit smoking.

Come rev up at Sandia's GAS — that is, Great American Smokeout — stations on Thursday, Nov. 21. Sponsored by the American Cancer Society, the GAS is the day on which smokers promise to quit for 24 (or more) hours. Research has shown that successful quitters are those who make a definite commitment to quit on a specific target date. Here's your chance!

This year, if you're among the first 100 smokers to take the no-smoking-for-a-day pledge, you'll be able to fuel up on munchies at either of the two GAS stations, one in Bldg. 801 (next to the Snack Bar) and one in the lobby of Bldg. 822. But such survival kits will cost you — to qualify you'll have to deposit your cigarettes in the bright red receptacle at each station. The stations, open from 8 a.m. to 1 p.m., will also have Quit Smoking tips, Adopt-a-Smoker contracts (see related story), posters, and stickers.

Dr. Judy Ewing and Dr. Sarah Snider, both of Medical, will staff the GAS stations between noon and 1. They'll be ready to answer any questions you might have — is life worth living? how long till midnight?

Again this year, the Cafeteria will feature a cold turkey sandwich special.

Medical and the Friends of Health invite you to make 1985 the year that you did something really special for yourself.

Non-Smokers: Help a Friend

The GAS (Great American Smokeout) on Nov. 21 is a once-a-year opportunity for non-smokers to adopt a smoker for a day. Your task is to help your friend get through 24 hours without a cigarette. The GAS stations in Bldgs. 801 and 822 will have Adopt-a-Smoker contracts and other aids for the two of you.

Here are some other ideas:

- Don't nag or threaten!
- Make yourself available either in person or by phone for the entire day.
- Take your adoptee out for breakfast or lunch. Or promise a special dinner at his or her favorite restaurant.
- Go public with your adoption. Enlist the aid of others in giving moral support to your adoptee.
- Give up something for the day (candy, desserts, coffee, etc.), especially if you're a never-smoker.
- If you're an ex-smoker, share your experiences; what worked for you may work for others. But don't lecture.
- Offer a lift to work or home in the afternoon.
- Schedule an evening activity that minimizes the temptation to smoke — take in a movie, try a strenuous activity (racquetball, a swim, etc.), or get together with fellow adopters and adoptees.
- Be a cheerleader — offer praise, encouragement, and, at the end of the day, congratulations.
- If/When your friend makes it for a day, urge him/her to stay off cigarettes permanently.

Congratulations

Harriet Otteni (3531) and Alan Morgan, married in Albuquerque, Oct. 11.

Becky and Bob (2601) Amdahl, a daughter, Sammi Ann, Oct. 13.

Glenda and Mike (342) Hall, a son, Gregory, Oct. 15.

Bring Back the Blab School

. . . "Before the late 1920s and 1930s, American culture was *out loud*. We continually turned print into sound. Mother read or recited to infant. (Memorization allowed entertainment even while both hands made bread.) Grandfather read from Prophet and Gospel; his grandson performed chapters from Scott and Dickens. At school we recited in chorus multiplication tables, state capitals and Latin declensions. We studied spelling, Shakespeare and history by committing them to memory. When we stopped memorizing and reciting literature, our ability to read started its famous decline. It was the loss of recitation — not its replacements (radio, film, television) — that diminished our literacy . . . . If when we read silently we do not hear a text, we slide past words passively, without making decisions, without knowing or caring about [the words' tone]. In the old Out-Loud Culture, print was always potential speech; even silent readers, too shy to read aloud, inwardly heard the sound of words. Their culture identified print and voice. Everyone's ability to read was enhanced by recitation. Then we read aggressively; then we demanded sense . . . . As children speak poems and stories aloud, by the pitch and muscle of their voices they will discover drama, humor, passion and intelligence in print. In order to become a nation of readers, we need again to become a nation of reciters."

Donald Hall, *Newsweek*

Sympathy

To Dale Buchanan (6257) on the death of his mother in Albuquerque, Sept. 28.

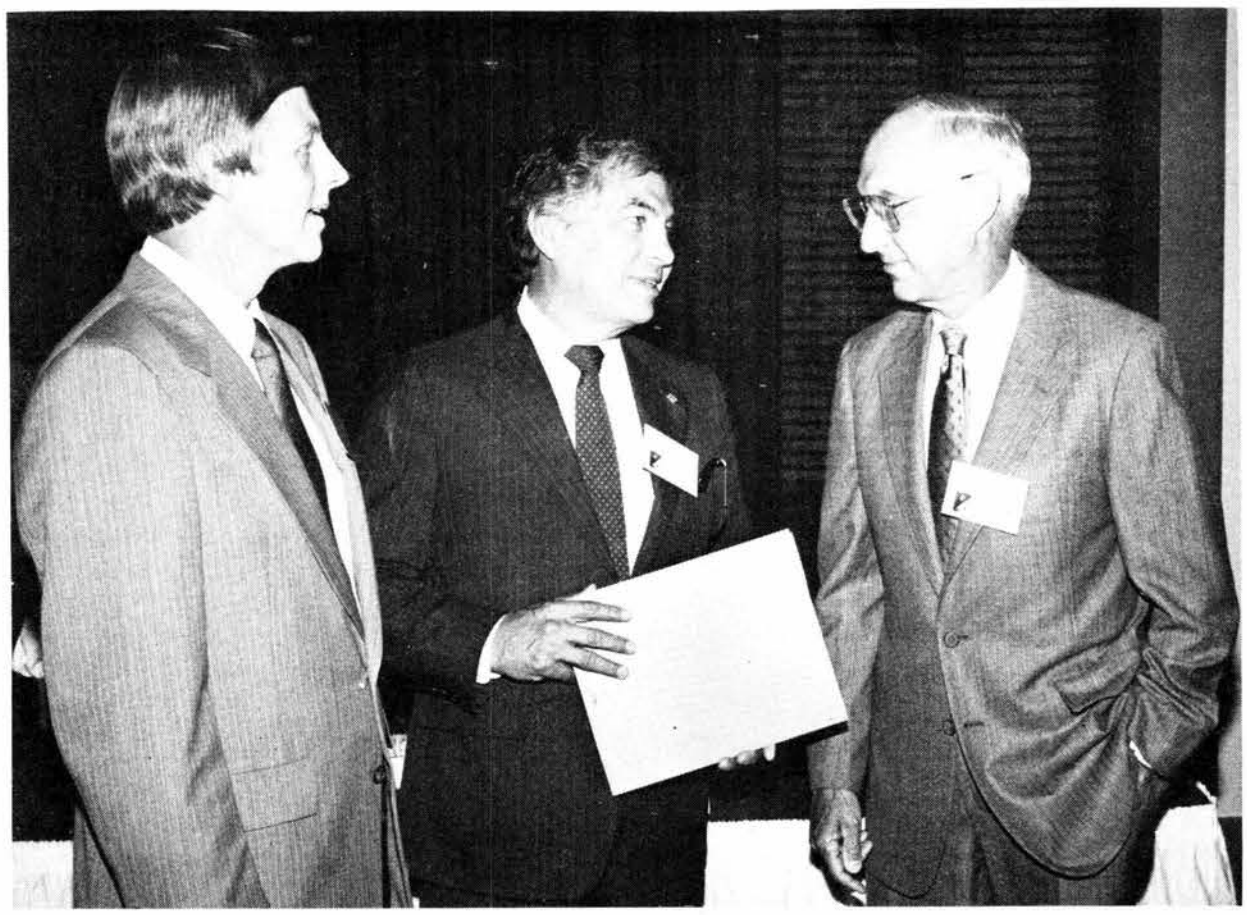
To Ralph Martinez (3426) on the death of his father in Albuquerque, Oct. 5.

To Willard Randall (7818) on the death of his mother-in-law in Albuquerque, Oct. 13.

To Dennis Flanagan (1523) on the death of his mother, while visiting Albuquerque from New York, Oct. 29.

Retiree Deaths

Georgia Howard (84)	May 17
George Jaramillo (87)	May 18
Catherine Helm (89)	May 19
Roy Wilcox (68)	July 6
Ray Smelich (67)	July 6
Lucille Hillebrand (80)	July 13
Luis Sandoval (69)	July 26
Jesse Parker (73)	July 27
Agnes Law (78)	July 28
Stanley Horn (65)	July 31
Arthur Gregory (78)	Aug. 7
Horace Pickard (70)	Aug. 11
Raymond Arnold (78)	Aug. 15
Adeline Scharping (78)	Aug. 21
Eleanor McPhate (72)	Aug. 26
Pedro Cordova (88)	Sept. 7
Margaret Foster (74)	Sept. 14
Daniel Alvino (67)	Sept. 18
Dorothy Calloway (54)	Sept. 20
Merton Jackson (65)	Sept. 21
Allan Gruer (74)	Sept. 22
Jack Baxter (71)	Sept. 28



UNM REGENTS CHAIRMAN Jerry Apodaca (center) met with Lee Bray (30), left, and Irwin Welber (2) at the Coronado Club luncheon during Hispanic Leaders Day. Other members of Small Staff at the luncheon were Tom Cook (20), Art Davie (3000), and Bob Peurifoy (7000).

Hispanic Leaders Visit Sandia

Approximately 130 community leaders representing schools, universities, and state government visited Sandia last month on Hispanic Leaders Day. The program briefs participants on Sandia programs, recruiting needs, and qualifications needed by those who apply for jobs at the Labs.

Hispanic Leaders Day, begun in 1978, is sponsored by Sandia's Hispanic Outreach Committee. Linda Vigil-Lopez (3511) chairs the committee. Other members are Lorraine Baca (1642), Al Lopez (6256), Ron Moya (5245), Tom Perea (2335), Carlos Quintana (1811), and Teresa Torres (6332).

"This year we tried to focus especially on teachers and school administrators who are in a position to encourage students to choose careers in science and mathematics," says Linda. "We were really pleased to see such a good turnout of Albuquerque Public Schools people, as well as representatives from other school districts in the area [Belen, Bernalillo, Moriarty, Santa Fe, and Taos]. They are the ones who can identify students who are potential employment candidates for Sandia."

Linda reports that three regents from two state universities attended the program this year: UNM regents' president Jerry Apodaca, UNM regent John Paez, and ENMU regent chair Ida Fernandez. State government representatives included Clara Jones, Secretary of State; Dan Lopez, Secretary of the Department of Finance and Administration; and Lila Maestas, a member of the Employment Security Department, who represented Governor Toney Anaya.

Hispanic Leaders Day visitors received briefings on Sandia programs in the morning at the Technology Transfer Center, followed by lunch at the Coronado Club. In the afternoon they toured the sled track and centrifuge facilities in Area III and visited PBFA-I.

LUNCHEON SPEAKER Art Davie (3000) reminded teachers that they play a very important role in influencing students to pursue scientific careers.

LINDA VIGIL-LOPEZ, head of the Labs' Hispanic Outreach Committee, introduced those seated at the head table during lunch at the Coronado Club.

At Rocky Flats

Sandia Provides Advanced Security System

Ribbon cutting ceremonies at Rocky Flats marked the recent start-up of an advanced security system designed by Sandia and installed at the DOE nuclear material production facility in Colorado.

The system (called PIDAS for Perimeter Intrusion Detection and Assessment System) integrates sensors, closed circuit TV, data and voice communications, and computer-controlled monitor and display equipment to provide total surveillance of the two-mile perimeter of the strategic nuclear material area of the plant.

The cleared perimeter is enclosed by two fences, and the space between them is divided into a series of sectors. Any intruder larger than, say, a rabbit in any sector is immediately detected by one of the microwave systems that detect changes in the field strength. Another means of detection is provided by fence sensors that detect any cut wire or any significant change in the tension of the fence wires. Each sector, brightly lit at night, is also surveyed by fixed TV cameras.

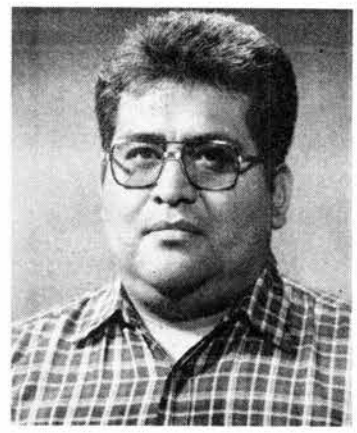
The status of each sector is continuously displayed on a CRT graphics map in the master console in security headquarters and in a second back-up control center. Any change in the status of a sector sounds an alarm and automatically brings to another console screen a close-up map that pinpoints the detection system disturbed. Still another screen automatically displays the image from the TV camera covering the disturbed sector. The console operator can immediately assess the situation.

In a letter to President Dacey, J.E. Dorr, Rocky Flats general manager, said, "On Aug. 1, representatives of your staff, DOE, and Rocky Flats Engineering and Security cut the ribbon to place this excellent state-of-the art system under our control...In particular, I would like to thank Jim Jacobs [5260] and his organization for the dedicated efforts and expertise in designing and overseeing the installation of this sophisticated system. I believe it is the most up-to-date alarm system anywhere within the DOE complex."

Sandia PIDAS project manager was Jim Martin, supervisor of Systems Engineering Division 5264. Intrusion Detection Systems Division 5249 under John Matter was responsible for sensors and TV; Security Systems Integration Division 5263 under Ric Davis developed hardware and software for control and display functions.

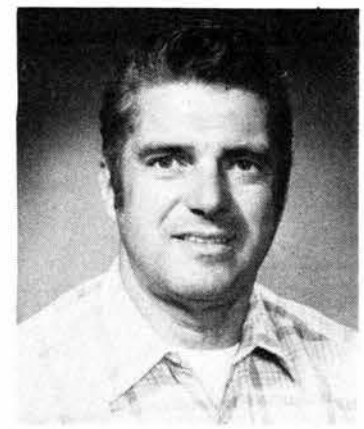
MILEPOSTS
LAB NEWS

NOVEMBER 1985

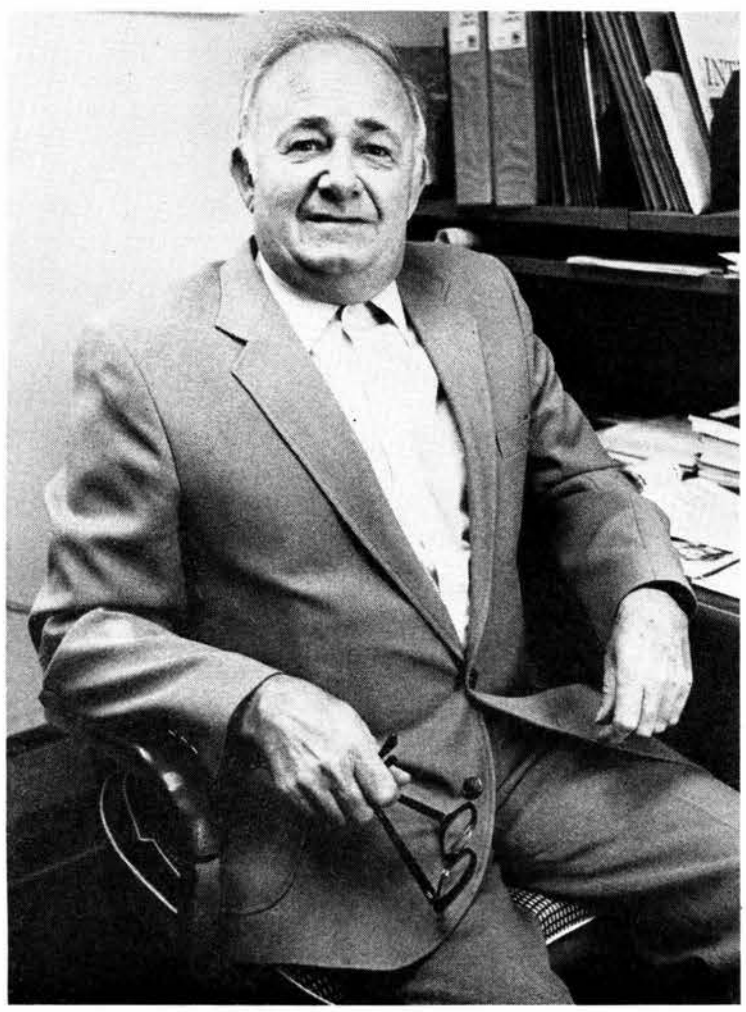


James Aragon (2855) 10

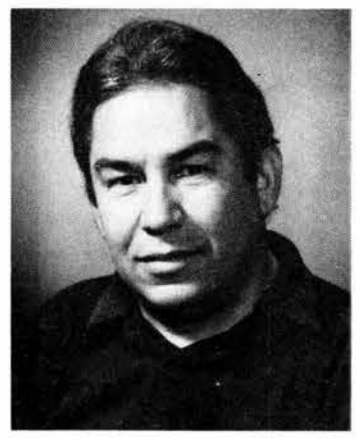
Dorothy Taylor (3721) 20



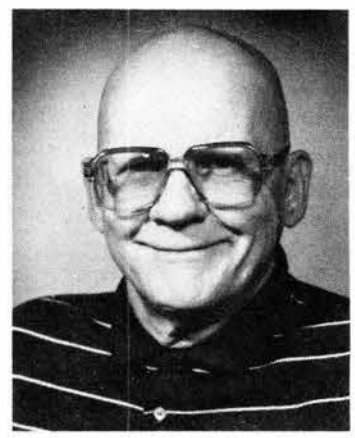
J.T. Wright (5322) 25



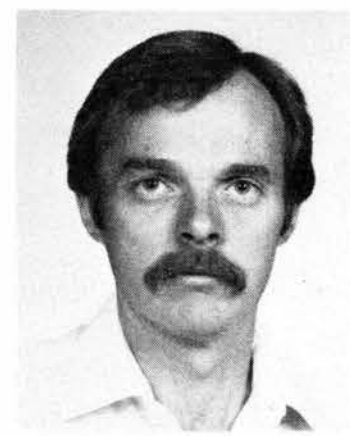
John Smelser (7525) 35



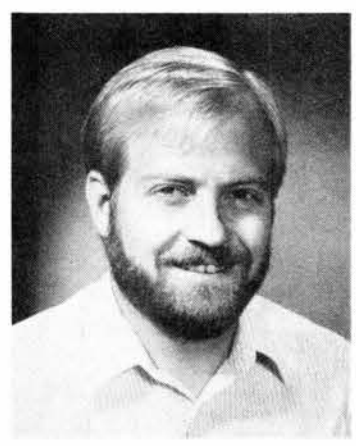
Tom Kain (7474) 10



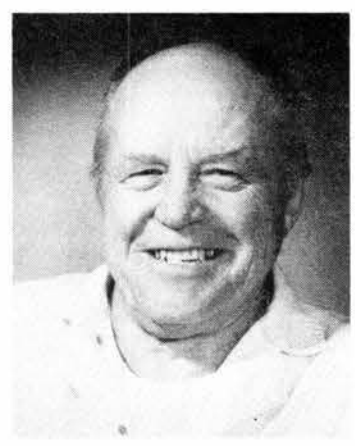
Jim Hare (6420) 30



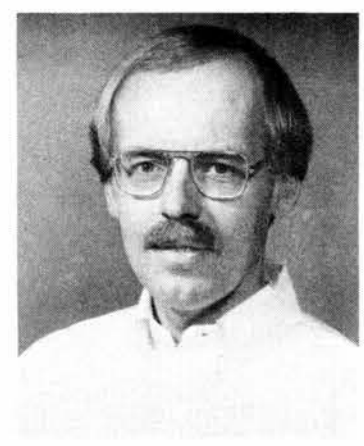
Doug Henson (8132) 10



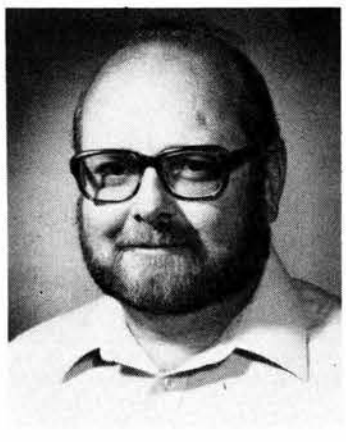
John Mitchiner (1623) 10



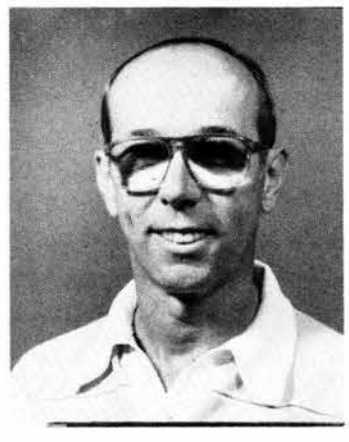
Leroy Henderson (7812) 35



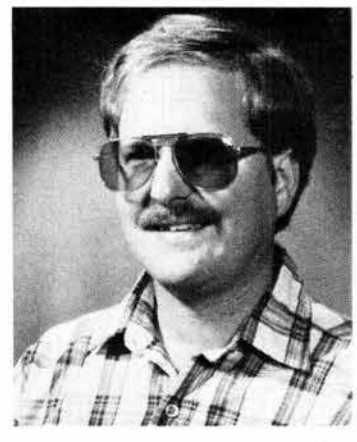
Craig Olson (1241) 15



Larry Choate (1233) 10

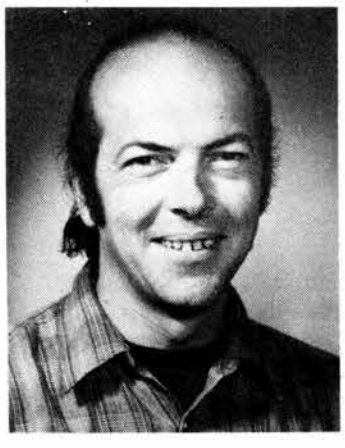


Dale Shenk (7133) 20

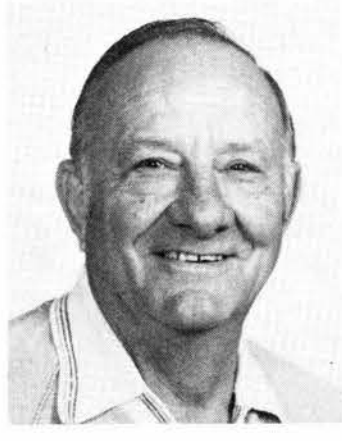


Ted Simmons (3312) 10

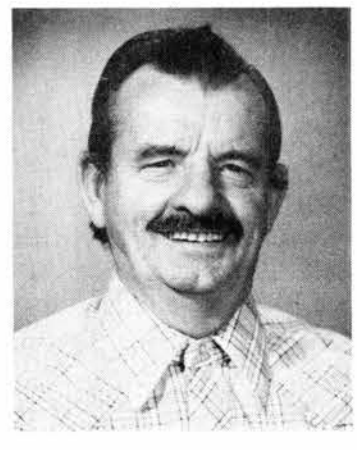
Rita Baca (3733) 10



Curtis Domme (7862) 15



Moe Robert (8257) 25



Charles Randall (3423) 35

11月21日を禁煙の日にしましょう。

(Japanese)

UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS • UNCLASSIFIED ADVERTISEMENTS

Deadline: Friday noon before week of publication unless changed by holiday. Mail to: Div. 3162.

Ad Rules

1. Limit 20 words, including last name and home phone.
2. Include organization and full name with each ad submission.
3. Submit each ad in writing. No phone-ins.
4. Use 8½ by 11-inch paper.
5. Use separate sheet for each ad category.
6. Type or print ads legibly; use only accepted abbreviations.
7. One ad per issue per category.
8. No more than two insertions of same ad.
9. No "For Rent" ads except for employees on temporary assignments.
10. No commercial ads.
11. For active and retired Sandians and DOE employees only.
12. Housing listed for sale is available for occupancy without regard to race, creed, color, or national origin.

MISCELLANEOUS

LADIES CLOTHING (all sizes); hanging Spanish lamp frame, red glass; misc. plumbing pipe. Street, 298-5784.

NEW LAZY-BOY recliner rocker, was $560, sell for $450. Mueller, 821-6391.

RIDER MOWER, 11-HP, 30-inch, 7-gear, new blades, $1100; sit-up board and mini-trampoline, $100; hamper/scale set, $10 OBO. Gallegos, 294-0233.

ALUMINUM WINDOWS, 3' x 6' (3), 6' x 4' (1), $25 each; 5½' bathroom sink and counter, $35; 14" tires, $20 all four. Schlesinger, 821-5527.

JACK STANDS, 4000-lb. (2 tons) cap., 12-19" adjustable, $4 ea. or four for $14. Allen, 296-6453.

GEM-TOP pickup cover, fits '71-'79 Ford Ranchero, side louvre windows, $250. Harnar, 281-1735.

TIRE CHAINS, bar reinforced, Sears, 8.00-14, 8.25-14, 8.55-14, F70-14, G70-14, G78-14, 205R-14, 7.10-15, 7.75-15, 8.15-15, 8.25-15, F78-15, $10. Schkade, 292-5126.

EXERCISE CYCLE, lightweight, pedal and row, hardly used, $20. Cosden, 881-1412.

FREE SPAYED ALASKAN MALEMUTE and house to good home; two authentic Seeburg teardrop jukebox speaker enclosures (Bakelite), $60 OBO. Diaz, 292-1450.

UPRIGHT GRAND PIANO by Cable, $995. Caldwell, 299-6480.

MILLING MACHINE, Kusnok Tool Works, .0005" precision, 6" x,y,z axes, 100 V, ½ HP. Douglas, 281-9504.

PORTABLE GENERATOR, Sears, never used, 7000 watt, voltage output - 120/240, electric start, 16 HP, $1600 OBO. Adams, 299-0855 or 292-7784.

9-DRAWER WOOD DRESSER with mirror, $50. Caton, 294-4490 evenings and weekends.

CROSS COUNTRY no-wax Trak skis, Exel poles, Heierling boots, ladies size 39 (7½-8), $75 for all. Carrick, 266-0191.

VANITY DRESSER, old, hardwood; antique coffee and occasional tables. Strance, 298-0258.

AJAY OCTAGYM exercise machine, $95. Patrick, 265-4569.

KITCHEN COUNTER TOP (white marble Formica); white sink; coppertone range top and built-in oven. Zutavern, 298-6523.

NEW VIDEOCAMERA, 3-tube JVC110BYU, ½" VHS/and peripherals, factory warranty until May 1986, $5200 new, $4400 OBO. Garner, 292-3859.

WINDSURFER, Alpha Fascination II, 12-ft, double-concave hull, varioboom and mast base, retractable CB, 5.5m-square fully-battened Mylar sail. Ritchey, 268-7620.

PIANO, Wurlitzer, spinet w/bench, $1000. Archuleta, 298-9018.

LAWN EDGING, flexible composition material, 3" high, eight 50-ft. rolls, $4 per roll. Shepherd, 299-9066 after 5.

LADIES GREEN SKI JACKET/PANTS, size large, $20. James, 296-3597.

LEATHER COAT, ladies size 8, black, Jordan's label, cost $100 new, sell for $35 OBO. Kubiak, 265-6525.

SPORTSMAN SHELL for 8-ft. bed, insulated, paneled, w/small cupboard, price negotiable. Schaeffer, 299-4335.

WASHING MACHINE, 1984 Whirlpool, nearly new, 3 cycles, water level control, $385. Jones, 299-4776.

19" ZENITH COLOR TV w/stand; Kenmore sewing machine in cabinet. Rosborough, 298-3645.

FIRM MATTRESS, full size, Sleep n'Aire, used 6 months, in a box, $80. Smith, 299-7151.

COUCH AND CHAIR, black naughahyde, $125; kingsize fiberfill waterbed mattress, liner and heater, $75. Love, 821-8794.

¾ SIZE VIOLIN, Meyer (West Germany), w/case and bow, spruce top, $265 (if new, $385). Kupferman, 265-7224.

REFRIGERATOR, 14 cu. ft., avocado, manual defrost, $65. Brockway, 247-9460.

R/C GEAR, Cirrus 900XLC, 7-channel system and Fox .45BBR/C, both new; Great Planes Trainer 40; much more, $250. Benecke, 255-1356.

FUZZBUSTER II radar detector, mounts on dashboard and plugs into cigarette lighter, emits visual and auditory signals, $15. Barr, 821-5870.

ORGAN, Lowrey Jubilee, Model 525, pecan finish, $2800. Durkee, 255-4211.

IDLETIME slide-in camper with boat rack. Gleason, 873-0209.

COFFEE TABLE and end table, $150 for both. Helling, 281-5536 after 5 or 345-0678.

TWIN BEDROOM SET, blond; sofa/sleeper; cabinet sewing machine; glass top and end tables; desk, TV, chairs, mirrors. Baars, 255-9051.

SANYO AUTOMATIC WASHER, apartment size, 3 wash cycles, $75. Beardsley, 292-5910.

SKI BOOTS, Lange XLS, used one season, size 7½, $45. Kelly, 281-9774.

SPARE TIRE COVERS for van, 1 each chrome ring, has small dent, $14; 1 each vinyl, dark brown, new, $12. Marchi, 299-8516.

JVC VIDEO RECORDING SYSTEM, GX-N7U camera, HRS100 VCR, 4 NB-P4U batt/w/charger, carrying cases, new $2590, $1990 OBO. Corey, 294-4545.

TV, 19", B&W, $50; chair, red velvet seat and back, $40; upholstered chair, blue pattern, $50. Duvall, 881-4406 after 5.

IBM PC clone, 640K on mother board, Hercules compatible monochrome board, floppy disk control, $500. Chu, 298-1073.

RIFLES, custom .30-06 03-A3, Weaver K4 scope, case, $185; custom .243, Bushnell 3X-9X scope, case, $185. Womelsduff, 255-5028.

SHOTGUN, 12-gauge-pump, Sears mod. 200 with variable choke, $150. Smiel, 865-9081.

SKIS, Rossignol Jr., 130 and 140 cm, with Look bindings and brakes, $42; Heirerling Jr. boot, size 6, $10. Wickesberg, 294-8334.

OLYMPUS OM1 with 28-90 Series 1 lens; Piper P71 ski rack, fits most hatchbacks; A&E RV awning, 17'. Fine, 268-4491.

FIESTA DISHES, for the carefree collector, nick-n-scratch prices. Mikkelsen, 881-3921.

HIDE-A-BED, double size, light toast color, innerspring mattress, $100. Alvis, 298-3906.

BEDROOM SET, 4-pc., French Provincial canopy, dbl., $300; boy's car bed, orange Corvette w/stripes, silver fin, twin, $200. Maldonado, 821-5041.

SKIS, PRE 1100, 190cm, w/Salomon 5737 bindings, $145; women's boots, Dolomite, size 7, $45. Navratil, 293-5527.

CAMPER SHELL for full-size pickup bed, paneled and insulated, $150. Randall, 299-3935 or 299-6751.

ETHAN ALLEN dining table/4 chairs, condo size, solid maple, nutmeg finish, no-mar top, $300 OBO. Black, 296-8414.

AKC OLD ENGLISH SHEEPDOG PUPPIES, 6 weeks old. Dalton, 873-0176.

FIRESCREEN w/andirons, $25. Crawford, 881-3812.

OSCILLOSCOPE, Heathkit Model IO-4550, 10 MHZ dual-trace, new and assembled, some trouble-shooting necessary, $225. Rodriguez, 255-6506.

OLD GUNS at appraisal; Western saddle, $300; two used Navajo rugs at appraisal; ping-pong table, $90. Harley, 898-6035.

BEDROOM FURNITURE, white French Provincial, double dresser, makeup table, bookcase/hutch, dovetail construction, $450. Seward, 822-1218.

COUCH, Early American, 3-cushion, brown tweed, 90" long, $80; single bed headboard and frame, $15. Fisher, 298-0526.

STEREO, $75; grandfather clock kit, $85; sewing machine, $150; buffet table, $250; ping-pong table, $70; mirror, 30"x60", $50. Gaither, 299-0351.

FREE TO GOOD HOME, Australian Shepherd/Chow, 2 years old, all shots, spayed, gentle personality, good with children. Slagle, 821-1295.

COMPUTER SYSTEM, Apple II+, 64K memory, two disk drives, monitor, DOS 3.3, BASIC, Pascal, games, graphics programs, $700. Shurtleff, 884-4909.

FISHING HUT CAMPER, '78 Mitchell, includes jacks, awnings, portapotty, electrical wiring. Tucker, 869-3469.

SKIS, Head Recreational 195, used one season, $75; Kastle, 175 cm; boots, Dynafit, women's size 8; bindings, Salomon. Ashment, 293-2295.

CRIB, $40; kingsize waterbed headboard/mattress, $25 each. Schwartz, 294-1113.

COLONIAL ROCKER, $25; exercise bicycle, $45; jogger/trampoline, $15; weight set, complete, $15. Jarrell, 293-9671.

ALPACA RUG from Peru, 4' x 5', $150; Spanish-style silver necklace/earrings, $65; Russian 35mm camera, $150. Schubeck, 821-3133.

MOVING SALE Nov. 9-10, 3421 Inca NE, Italian Provincial bedroom set, refrigerator, washer, dryer, stereo, recliner, chairs, misc. McCreight, 296-3293.

TRANSPORTATION

'80 SILVERADO PICKUP, V8, under 60K miles, loaded with extras, $5400. Vance, 255-8032.

'80 TOYOTA Corolla SR-5, 45K miles, AC, AM/FM cassette, 5-spd., $4250. Johnson, 296-3609.

'83 HONDA motorcycle, C.R. 480 dirt bike, never raced, $1100 OBO. Gilbert, 898-2605.

'76 CHEV. Monte Carlo, AT, PS, PB, AC, maroon/maroon, 72K miles, no accidents. Dyckes, 299-7280.

'79 SUBARU stn. wgn., 4WD, AC, one owner, 79K miles, $2500 OBO. Padrick, 299-7971, leave message.

'80 OLDS Cutlass Supreme Brougham, electric astroroof, power windows, cruise, AM/FM/stereo/cassette, and more, $3995. Harrington, 294-6368.

'82 DODGE Aries, AC, PS, PB, AT, 4-cyl., 4-dr., 63K miles, $3000 OBO. Oberst, 299-1224.

'81 YAMAHA Virago, XV750, 7600 miles, with extras, asking $1200 or trade for car. Praefcke, 881-0604.

'63 CORVAIR 110 coupe, buckets, radials, AT, FM-tape, $1100 OBO. Monti, 883-1413.

FREE ultralight aircraft; will donate Weedhopper ultralight to organization that qualifies us for tax deduction. Maxam, 898-2435.

'83 DATSUN Maxima, 4-dr., loaded, all power, $9600 OBO; '82 Toyota LWB pickup, AT, AM/FM, $4600 OBO. Gallegos, 294-0233.

'80 TOYOTA 4WD longbed sport truck, white, fully loaded, 39K miles, shell, new tires, $6795 OBO. Burek, 281-2206 after 6:30.

19' TRAVEL TRAILER, '62 DODGE pickup, new engine, front end shocks, exhaust, camper shell, $5000, will split. MacInnis, 898-1628.

'80 DATSUN Pickup Mod 720 long bed, AT, AM/FM cassette stereo, fiberglass shell, all-season steel radials, 43K miles, $2800. Mooney, 281-2612.

'78 TOYOTA Celica, 5-sp., AC, window louvers, 93K miles, original owner, $2000 OBO. Barnard, 831-4114 evenings.

'51 CHEV. pickup, 5-window cab, 95% restored to original, new paint inside and out, $3800. Penn, 883-4195.

'68 COUGAR, V8, 289, PS, AT, $1500. Casper, 266-2625.

BICYCLE, men's 3-spd, best offer. Joseph, 299-6989.

MOTORHOME, '72 Winnebago Class A, 24' Chieftain, good engine, needs cosmetics, transmission, generator work; good for handyman, $4200. Hueter, 242-1620.

'85 KAWASAKI KX80, $750. Brigham, 292-4399.

'78 TOYOTA Corona, 4-dr. sedan, 5-spd, AM/FM stereo, original owner, $2525 OBO. Erne, 299-0565.

BMX Mongoose bike with Z-rims, light pads, laid-back seat post, $180. Connor, 268-9497.

'81 EAGLE SW, 4X4, AC, AM/FM tape, loaded, $5300. Desonier, 292-1277.

'70 FORD Shasta motorhome, new tires, shocks, paint, low mileage, $5500. Hogeland, 881-3376 after 6.

'73 TOYOTA Corona stn. wgn., $750. Loehman, 365-1504.

'85 VOLVO 740 GLE, 13,100 miles, 4-dr., 4-spd., AT, AC, sunroof, stereo. Mariani, 296-1821 after 5.

'76 MERCURY Monarch, recently painted, $1050. Chambers, 291-8574.

'70 MERCURY Marquis stn. wgn., 390 V8, PS, PB, AC, AT, good tires, $700. Harstad, 298-6551.

'79 CHEV. Monza, V6, AC, PS, PB, sunroof, rear defroster, louver, $1300. Crawford, 883-5545.

'82 CORVETTE, all options, red on red, 17K miles, glass T-tops, extended warranty. Ashment, 293-2295.

'85 TOYOTA MR2, silver, 7500 miles, 5-yr. unlimited mileage warranty (transferable). Keicher, 298-0596.

BEARVILLE 12-passenger van, loaded, incl. dual AC, PB, PS, cruise, stereo, low mileage (road), original owner, $4000. Atkins, 298-5762.

'85 KTM 250, water-cooled, 5-spd., brand new, $2200 OBO. Wenk, 293-3372 after 5.

'79 CHEV. Monza, 4-cyl., 4-spd., brown, hatchback, $1000. Hall, 262-0084.

'67 4WD WAGONEER, body damaged. worn clutch, runs, $500 cash. Morosin, 298-0994.

'75 CHEV. Monza, V8, PS, PB, AT, snow tires, one owner, $930. Ostensen, 296-4227.

'71 VW SUPERBUG, m/s tires, $2500. Bush, 281-3773.

'71 DODGE POLARA, AC, PS, radio, new tires, original owner. Blewer, 268-9019.

REAL ESTATE

3-BDR. HOME, Ridgecrest area, open floorplan, two baths, double garage, 5 minutes to Base, Southwest landscaping, $87,500. Mauldin, 265-5650.

PLACITAS, quiet mountain home with views, spacious rooms, passive solar, 2/3 acre, 2000 sq. ft., $89,900. Field, 877-8563 evenings.

TOWNHOME, 3-bdr., 1200 sq. ft., faces small park in Guadalupe Village, with all appliances, $47,900. Weaver, 296-0992.

4-BDRM HOME in Grants, 1¾ baths, 1485 sq. ft., den, basement, block fence, wood-burning stove, $30,000, consider all offers/trades. Chavez, 296-3160.

4-BDR., 1¾ bath, new appliances, in-ground pool, spa, solar heat, upgraded throughout, nice yard, northeast heights. Rexroth, 293-6025.

MOBILE HOME, '73 Craftmade, 14' x 60', 2-bdr., 2 bath, $11,000, Four Hills Mobile Park. Self, 296-4137.

4-BDR. HOME, 2000 sq. ft., 1¾ bath, LR/DR, large kitchen, landscaped w/auto sprinklers, gazebo w/spa, Eldorado school, available 4/86. Ratzel, 821-6368.

COUNTRY BRICK HOME on 10 acres near Edgewood, 4-bdr., 2½ bath, 3-car garage, solar, other amenities, will trade, owner financing. Sanchez, 832-6206.

WANTED

PIANO, upright w/bench, $100 to $300 range. Sanderlin, 298-7147.

DARKROOM TIMER, and/or functional 35mm SLR. Need for middle school photography class, free or cheap (donate to school). Carr, 281-1632.

TELESCOPING TOWER, tubular or triangular cross section, 35-45 ft. tall. Moore, 294-5646.

WIRING DIAGRAM for 1970 Plymouth Fury. Harris, 344-6640.

CRAFTSMAN TABLE SAW, 10-inch, with or without motor. Allen, 296-6453.

'72 OR EARLIER HONDA 750; prefer without accessories; will pay cash. Barnard, 831-4114 evenings.

FEMALE ROOMMATE, non-smoker, NE heights home, own bdr. and bath, $200/mo. + ½ utilities. Jordan, 881-8310.

MALE ROOMMATE, for house in Indian School/Tramway area, own bedroom/bath, non-smoker, $225/mo. + ½ utilities, Roach, 296-0432.

ENCYCLOPEDIAS, recent. Black, 296-8414.

SLIDE TRAYS for Sawyer projector, rotary-type only; could also use trays from GAF or Keystone projectors. Schwartz, 294-1113.

SHARE-A-RIDE

WILL PAY $3/day for carpool ride, no driving, from vicinity 4th and Osuna, NW. Finger, 345-6865.

Coronado Club Activities

Jazz Band Plays Tonight

EVERYBODY KNOWS the two-for-one Friday night dinner special is one of the best deals in town. And tonight's deal is something else — prime rib or poached halibut, two dinners for just $12.95. Other entrees (also two-for-one) available at different prices. But that's not all, folks. Afterwards the Albuquerque Jazz Band does its thing on the bandstand for your dancing pleasure.

A SKI REPAIR CLINIC sponsored by the Coronado Ski Club is scheduled Nov. 13, 7-9 p.m., in the Eldorado Room. Dave Wall of Competitive Spirit will show you how to get those skis in shape for the coming season. The Ski Club meeting on Nov. 19 will feature a talk on USRSA (U.S. Recreational Ski Association) week, coming up in Sun Valley, Idaho, Jan. 18-26.

NEXT FRIDAY, Nov. 15, the two-for-one dinner special features filet migon or scallops. It's all topped off by the happy music of the Western Flyers.

RETIREES really enjoy getting together for those card games at the Club. Get in on the fun on Monday, Nov. 18, from 10:30 a.m. to 3 p.m. in the Eldorado Room.

THE SAME DAY the retiree card sharks are getting together (Nov. 18), the Thunderbird retiree group's board will be meeting at the Club at 2:30 p.m. The meeting is open to all Thunderbirds, not just board members.

ANOTHER retirement planning seminar is set for Wednesday, Nov. 20, at 5 p.m. in Rm. B5. Dean Witter financial analysts Steve Stubbs and Norm Chavez will help you wade through those questions on lump sum settlements, monthly payment options, 10-year averaging, etc.

MORE THUNDERBIRD news (these retirees are certainly a busy lot!) — The Thunderbird RV group's next outing will be at Santa Rosa Lake (seven miles north of Santa Rosa), Nov. 19-21. More info from Charlie Kaspar, 821-5521.

THE SINGLES SCENE is alive and well at the C-Club. Come on out and mingle on Thursday, Nov. 21. Live music by Half & Half, and the usual special prices on beer and margaritas!

MARK YOUR CALENDAR now for Western Night on Nov. 23. It all starts at 5 p.m. with cocktails, followed by a buffet (all-you-can-eat BBQ ribs, western baked beans, coleslaw, potato salad, carrot salad, assorted cakes for dessert) from 6-8 at the unheard-of price of $4.75. Then those good old Isleta Poor Boys play (what else?) country-western music for all you stompers. Call the Club office for reservations.

TRAVEL — Warm tropical breezes, white sandy beaches — what could be better for winter-weary Albuquerqueans in the middle of February? A Caribbean Cruise Feb. 15-22 aboard the fabulous Sun Princess will take you to six (count 'em) ports of call — Curacao, La Guaira, Palm Island, Martinique, St. Thomas, and San Juan. In between ports, you'll enjoy award winning cuisine five times (!) a day, movies, dancing, floor shows, pool, casino, sauna, and — most important — rest and relaxation on board the Sun Princess. Rates from $1415-$1572/person, depending on stateroom choice. Price includes round trip air fare from ABQ to San Juan, transportation from San Juan airport to Sun Princess pier, port and departure taxes, and on-board accommodations. Reservations at the Club Office or Zia Travel Services (10 percent deposit required) — line up now, because the deadline is Dec. 13. And to get you in the mood, attend the Cruise Travel Show at the Club on Nov. 18 at 7:30 p.m. See a film on Caribbean cruising, and have all your questions answered. Refreshments too.

DON'T FORGET that Commonwealth Theatres coupon book bargain, available at the Club office for $5. It's good for free movie admissions, refreshment discounts, and two-for-one specials.

NEW CLUB CATERING manager Maggie Pappas invites your suggestions on menus, and says she's there to help on all your special catering needs. Give Maggie a call at the Club office if you need assistance with that private party.

Welcome

Albuquerque
- Kevin Carmichael (2314)
- Louellen Baldoni (21)
- Evonne Garcia (22)
- Rebecca House (21)
- Judith Jones (22)
- Cheryl Kulawinski (22)
- Elaine Lisenbee (22)
- Dolores Maes (21)
- Martha Morgan (21)
- Laverne Sparks (22)
- Regina Valenzuela (22)

Arizona
- Andrew Phillips (3714)

Colorado
- Christopher Rautman (6315)

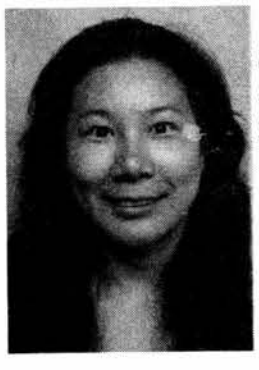
Minnesota
- John Glick III (5266)

Mississippi
- Gene Faucett (155)

New Mexico
- James Hawthorne (2526)
- Lucille Baca (21)
- Naomi Maes (21)
- Vance See (21)

Oklahoma
- Christine Viney (1631)

Death



Christina Huang of Space Systems Division 5312 died suddenly Oct. 20. She was 35.

She had worked at the Labs since April 1984.

Survivors include her mother, three brothers, and a sister.

volunteers in action

Here are some current volunteer opportunities for employees, retirees, and family members. If you would like more information, call Karen Shane (4-3268).

JACKSON MIDDLE SCHOOL needs a coach (one hr./wk.) for its team of four students who will participate in MATHCOUNTS 1986. This national program of mathematics coaching and competition was cited for outstanding achievement as part of the President's Private Sector Initiative. Regional competitions will be Feb. 22 in Albuquerque.

ANIMAL HUMANE ASSOCIATION, a non-profit organization, needs volunteers to work in its gift shop (no direct work with animals). Volunteers are needed to work in pairs for a single weekly shift of three hours (your choice of a 10 a.m. to 1 p.m. or 1 to 4 p.m. slot) any day, Monday through Saturday.

ADELANTE DEVELOPMENT CENTER, a United Way agency, needs a volunteer with electrical/electronic skills to design a narrow, intense light beam for a communications wand for a handicapped person.

SENIOR ESCORT PROGRAM, operated by the Office of Senior Affairs, needs volunteers for a four-hour period once a week to take elderly clients to grocery stores, doctor appointments, etc. Drivers will be matched with persons in their quadrant of the city. Mileage will be paid.